

REMARKS

The Applicants respectfully request further examination and reconsideration in view of the amendments made above and the comments set forth below. The Specification has been amended to correct a minor typographical error. Within the Office Action, claims 1-17 have been rejected. Claim 13 has been rejected under 35 U.S.C. § 112, second paragraph. Claims 1, 7-8, and 14 have been rejected under 35 U.S.C. § 102(a). Claims 2-6, 7-12, and 15-17 have been rejected under 35 U.S.C. § 103. By the above amendment, claim 13 has been amended to overcome a 35 U.S.C. § 112, second paragraph, rejection. Claim 11 has been amended to correct a minor typographical error. Claims 1 and 14-17 have been amended to more clearly define the invention. Accordingly, claims 1-17 are pending.

Rejection under 35 U.S.C. § 112, second paragraph

Within the Office Action, claim 13 was rejected under 35 U.S.C. § 112, second paragraph, as failing to set forth the subject matter which the Applicants regard as their invention. Specifically, within the Office Action it is stated, "In this instance claim 1 on which this claim depends recites [a] single mechanical drive to keep the chamber closed and sealed under pressure while this limitation recites an additional mechanical clamp to maintain the chamber under high pressure. This is in obvious conflict with the independent claim 1."

In response to the rejection under 35 U.S.C. § 112, second paragraph, claim 13 has been amended to recite a single mechanical drive mechanism that *forms* a wafer cavity and a mechanical clamp that *maintains* the wafer cavity during high pressure processing. As amended, claim 13 no longer conflicts with claim 1. Accordingly, the rejection of claim 13 under § 112 should be withdrawn.

Rejections under 35 U.S.C. § 102(a)

Within the Office Action, claims 1, 7-8, and 14 were rejected under 35 U.S.C. § 102(a) as being anticipated by Japanese Patent Number JP2000-106358A, to Yasuda (Yasuda). The Applicants respectfully disagree with these rejections.

Yasuda is directed to a system for processing semiconductor wafers. The system comprises a processing tub for plasma etching a semiconductor wafer. [Translation of Yasuda, ¶ 0007] The system is also configured to clean the processing tub and an enclosed wafer using

supercritical fluids. [*Id.*, ¶¶ 0026 and 0030] In Figures 1 and 2, cited within the Office Action, Yasuda teaches a hydraulic jack 111 coupled to a septum 110. The septum 110 is coupled to a support 117, which in turn is coupled to a maintenance base 101. The maintenance base 101 functions as a wafer platen, supporting the wafer 102 during both wafer processing and tub cleaning. The system also comprises a microwave generator (not shown) coupled to the interior of the processing tub. [*Id.*, ¶ 0018] The microwave generator generates a plasma within the interior of the processing tub, which is used to etch the semiconductor wafer. [*Id.*, ¶ 0025]

As illustrated in Figure 1, during low-pressure processing (e.g., etching) of the wafer 102, neither the maintenance base 101 nor the septum 110 forms a seal with the processing tub. In this way, a flow path is created so that processing gas is pumped through the gas inlet 103, over the wafer 102, and out the exhaust port 106. The maintenance base 101 can be optimally raised to perform dry etching. [*Id.*, ¶ 0024] As illustrated in Figure 2, during high-pressure cleaning of the processing tub, the septum 110—not the maintenance base 101—contacts a corner 191 of the processing tub 100a to form a wafer processing chamber around the wafer. [*Id.*, ¶ 0022] The maintenance base 101 (*i.e.*, wafer platen) does not contact the processing tub to form a high-pressure chamber.

The present invention is directed to a high-pressure chamber for processing a semiconductor substrate. The chamber comprises a chamber housing with a first sealing surface and a platen with a second sealing surface. The platen is used to hold a semiconductor substrate. The chamber further comprises a mechanical drive mechanism that couples the platen to the chamber housing. In operation, the mechanical drive mechanism causes the first sealing surface and the second sealing to contact, thereby forming and maintaining a wafer cavity that contains the semiconductor substrate during high-pressure processing.

Because the present invention uses a platen and not a septum to form a wafer cavity, the claims distinguish over Yasuda.

Claims 1, 7, 8, and 14

The independent claim 1 is directed to a high-pressure chamber for processing a semiconductor substrate. The high-pressure chamber of claim 1 comprises a chamber housing having a first sealing surface, a platen comprising a second sealing surface and a region for holding the semiconductor substrate, and a single mechanical drive mechanism. The single drive mechanism has a single pressure source for forming and maintaining a wafer cavity for

containing the semiconductor substrate during high pressure processing. The single mechanical drive mechanism couples the platen to the chamber housing such that in operation the single mechanical drive mechanism separates the platen from the chamber housing for loading of the semiconductor substrate. In further operation, the single mechanical drive mechanism causes the second sealing surface of the platen and the first sealing surface of the chamber housing to contact, thus forming the wafer cavity and maintaining the wafer cavity during high pressure processing.

As discussed above, Figures 1 and 2 in Yasuda do not teach a sealing surface of the platen contacting a sealing surface of a chamber housing to form a wafer cavity and maintain the wafer cavity during high-pressure processing, as recited in claim 1. Instead, Yasuda teaches a septum contacting an inner corner of a processing tub to form a processing chamber. For at least this reason, claim 1 is allowable over the teachings of Yasuda.

Claims 7 and 8 are both dependent on the independent claim 1. As discussed above, the independent claim 1 is allowable over the teachings of Yasuda. Accordingly, claims 7 and 8 are also allowable as being dependent on an allowable base claim.

Claim 14

Claim 14 is directed to a high-pressure chamber for processing a semiconductor wafer. The chamber comprises a chamber housing, a platen comprising a region for holding the semiconductor substrate, a single mechanical drive mechanism having a single pressure source for forming and maintaining a wafer cavity for containing the semiconductor substrate, and means for sealing coupled to the chamber housing such that in operation the single pressure source causes the means for sealing, the platen, and the chamber housing to form the wafer cavity and maintain the wafer cavity during high pressure processing. The single mechanical drive mechanism couples the platen to the chamber housing such that in operation the single mechanical drive mechanism separates the platen from the chamber housing for loading of the semiconductor substrate.

As discussed above, Figures 1 and 2 of Yasuda do not teach a means for sealing coupled to the chamber housing such that in operation the single pressure source causes the means for sealing, the platen, and the chamber housing to form a wafer cavity and maintain the wafer cavity during high pressure processing, as recited in claim 14. Instead, Yasuda teaches that a septum,

not a wafer platen, is used to form a high-pressure processing chamber. For at least this reason, claim 14 is allowable over the teachings of Yasuda.

Rejections under 35 U.S.C. § 103(a)

Within the Office Action, claims 2-6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yasuda in view of U.S. Patent No. 5,798,126 to Fujikawa *et al.* (“Fujikawa I”). The Applicants respectfully disagree with this rejection.

Claims 2-6 are all dependent on claim 1. As discussed above, the independent claim 1 is allowable over the teachings in Yasuda. Accordingly, the dependent claims 2-6 are also allowable as being dependent on an allowable base claim.

Within the Office Action, claims 4, 5, and 7-9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yasuda in view of U.S. Patent No. 5,979,306 to Fujikawa *et al.* (“Fujikawa II”). (Within the Office Action, it is mistakenly stated that claims 4-5 and 7-9 were rejected under 35 U.S.C. § 102(b).) The Applicants respectfully disagree with these rejections.

Claims 4, 5, and 7-9 are all dependent on the independent claim 1. As discussed above, claim 1 is allowable over the teachings of Yasuda. Accordingly, claims 4, 5, and 7-9 are also allowable as being dependent on an allowable base claim.

Within the Office Action, claims 10-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yasuda in view of U.S. Patent No. 5,898,727 to Fujikawa *et al.* (“Fujikawa III”). The Applicants respectfully disagree with these rejections.

Claims 10-12 are all dependent on claim 1. As discussed above, the independent claim 1 is allowable over the teachings in Yasuda. Accordingly, the dependent claims 10-12 are also allowable as being dependent on an allowable base claim.

Within the Office Action, claims 15-17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yasuda in view of U.S. Patent No. 6,077,053 to Fujikawa *et al.* (“Fujikawa IV”). The Applicants respectfully disagree with these rejections.

Claim 15 is directed to an apparatus for high-pressure processing of a semiconductor substrate. The apparatus comprises a pressure chamber frame, a single piston coupled to the pressure chamber frame and comprising a piston body and a piston neck. The pressure chamber frame and the piston body form a first fluid cavity. The apparatus further comprises a sealing plate coupled to the pressure chamber frame. The sealing plate in conjunction with the pressure chamber frame, the piston body, and the piston neck form a second fluid cavity. The apparatus

further comprises a platen coupled to the piston neck. The platen comprises a region for holding the semiconductor substrate and a first sealing surface. The apparatus further comprises a top lid coupled to the pressure chamber frame. The top lid comprises a second sealing surface. The first sealing surface of the platen and the second sealing surface of the top lid are configured such that in operation the piston body can be moved using a single pressure within the first fluid cavity so that the first and second sealing surfaces contact to form a wafer cavity and maintain the wafer cavity during high pressure processing. In further operation the piston body can be moved so that the first and second sealing surfaces do not contact, thereby allowing the semiconductor substrate to be loaded into and unloaded from the pressure chamber frame.

Within the Office Action, it is stated that "Yasuda discloses a pressure chamber frame (Fig 1 and 2), and a sealing plate coupled to the hydraulics for supercritical as well as non supercritical processing." As discussed above, Yasuda does not teach a platen having a first sealing surface and a top lid having a second sealing surface which can be moved to contact and thus form a wafer cavity and maintain the wafer cavity during high pressure processing. For at least this reason, claim 15 is allowable over the teachings of Yasuda.

Claims 16 and 17 are both dependent on the independent claim 15. As discussed above, claim 15 is allowable over the teachings of Yasuda. Accordingly, claims 16 and 17 are also allowable as being dependent on an allowable base claim.

For the reasons given above, the Applicants respectfully submit that claims 1-17 are in condition for allowance, and allowance at an early date would be appreciated. If the Examiner has any questions or comments, the Examiner is encouraged to call the undersigned at (408) 530-9700 to discuss them so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,
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Dated: 10-31-03

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